

Claims

1. A material comprising an intimate mixture of keratin protein and a water soluble polymer.
- 5 2. A material according to claim 1 wherein the keratin protein is s-sulfonated.
3. A material according to claim or claim 2 wherein the keratin protein is a keratin protein fraction.
4. A material according to claim 3 in which the keratin protein fraction is from the intermediate filament protein family.
- 10 5. A material according to any one of claims 1-4 in which the keratin protein is intact.
6. A material according to any preceding claim wherein the water soluble polymer is selected from the group consisting of polyvinyl alcohol, polyvinylpyrrolidone and polyethylene glycol.
- 15 7. A material according to any preceding claim in which the material is a film, fibre or membrane.
8. A method for making a material comprising
 - (a) mixing a keratin protein and a water soluble polymer to form an intimate mixture;
 - 20 (b) casting the aqueous mixture so produced; and
 - (c) drying to create a material.
9. A method for making a material comprising:
 - (a) mixing a keratin protein and a water soluble polymer to form an intimate mixture;
 - 25 (b) extruding the aqueous mixture produced from step (a) into a coagulation bath through a process of wet spinning.
10. A method for improving the physico-mechanical properties of the materials produced by any one of claims 8-9 by introducing cross-linker agents to form disulfide bonds and thus remove sulfonate functionalities.
- 30 11. A method according to claim 10 in which the cross-linking agent used as a reductant is a thiol or thioglycollate salt.
12. The method according to claim 10 or claim 11 in which the physico-mechanical properties are wet and dry strength.

13. A method according to claim 11 in which the thioglycollate salt is ammonium thioglycollate solution.
14. The method according to any one of claims 8-13 wherein the keratin protein is s-sulfonated.
- 5 15. The method according to any one of claims 8-14 wherein the keratin protein is a protein fraction.
16. The method according to claim 15 wherein the keratin protein is from the intermediate filament protein family.
17. The method according to any one of claims 8-16 in which the keratin protein is
10 intact.
18. A method according to any one of claims 8-17 wherein the water soluble polymer is selected from the group consisting of polyvinyl alcohol, polyvinylpyrrolidone and polyethylene glycol.
19. A method of improving the wet strength properties of the materials produced by
15 the method of any one of claims 8-9 by incorporating a cross-linking agent into them.
20. A method according to claim 19 in which the cross-linking agent is a protein in to the intimate mixture.
21. A method according to claim 19 in which the cross-linking agent is selected from
20 the group consisting of formaldehyde and glutaraldehyde.
22. A process for improving the mechanical properties of a material produced by a method of any one of claims 8-9 by heat treating the composite matrix to enhance its crystalline properties.
23. A keratin protein derivative material in which the keratin is chemically linked to a
25 monomer or a polymer material.
24. A keratin protein derivative according to claim 23 in which the keratin protein is s-sulfonated.
25. A keratin protein derivative according to claim 23 in which the keratin is a keratin protein fraction.
- 30 26. A keratin protein derivative according to claim 25 in which the keratin protein fraction is from the intermediate filament protein family.
27. A keratin protein derivative according to any one of claims 23-26 in which the keratin is intact.

28. A keratin protein derivative according to any one of claims 23-27 in which the monomer or polymer material is from the acrylate, epoxide or anhydride group.
29. A keratin homopolymer material according to any one of claim 23-28 which is further polymerised.
- 5 30. A keratin material according to claim 29 in which has been further polymerised in the presence of an additional monomer from the acrylate, epoxide or anhydride group, to form a keratin copolymer material.